

## BOSTON'S CENTRAL ARTERY/TUNNEL PROJECT



### “Overview Presentation”

This Overview Presentation describes the **Innovations and Advancements** program and provides a general summary of each of the 12 “lessons.”

All of the lessons described in the **Innovations and Advancements** program are transferable and can provide important and beneficial information for any size construction project.



For more information or to schedule one of the above modules, please call:

**Mr. Daniel C. Wood, P.E.**  
CA/T Structural Engineer  
(617) 494-2462  
[daniel.c.wood@fhwa.dot.gov](mailto:daniel.c.wood@fhwa.dot.gov)

For more information on the CA/T Project and the **Innovations and Advancements** program visit the website:  
<http://www.bigdig.com>

FHWA Publication No.  
FHWA-ERC-01-002 (5M)

## Innovations and Advancements program



  
U.S. Department  
of Transportation  
**Federal Highway  
Administration**

While some aspects of the Central Artery/Tunnel Project (CA/T) in Boston, also known as the “Big Dig,” have been controversial, this monumental undertaking has been responsible for improving the state-of-the-practice in transportation design and construction. In an effort to expand awareness and valuable knowledge gained, the Federal Highway Administration (FHWA) has developed a technology transfer tool to share the innovations and advancements (managerial, operational, and technological) made on



the CA/T Project with audiences throughout the United States and the international transportation community. The “Innovations and Advancements” program covers many subjects; however, the 12 featured topics had the largest positive impact on the project and are worth considering on future projects. Also, these topics can be subdivided into three general topics:

**Project Management Lessons**  
**Operations Lessons**  
**Technology Lessons**



## PROJECT MANAGEMENT "LESSONS"

### LESSON 1: Project Director Management Issues



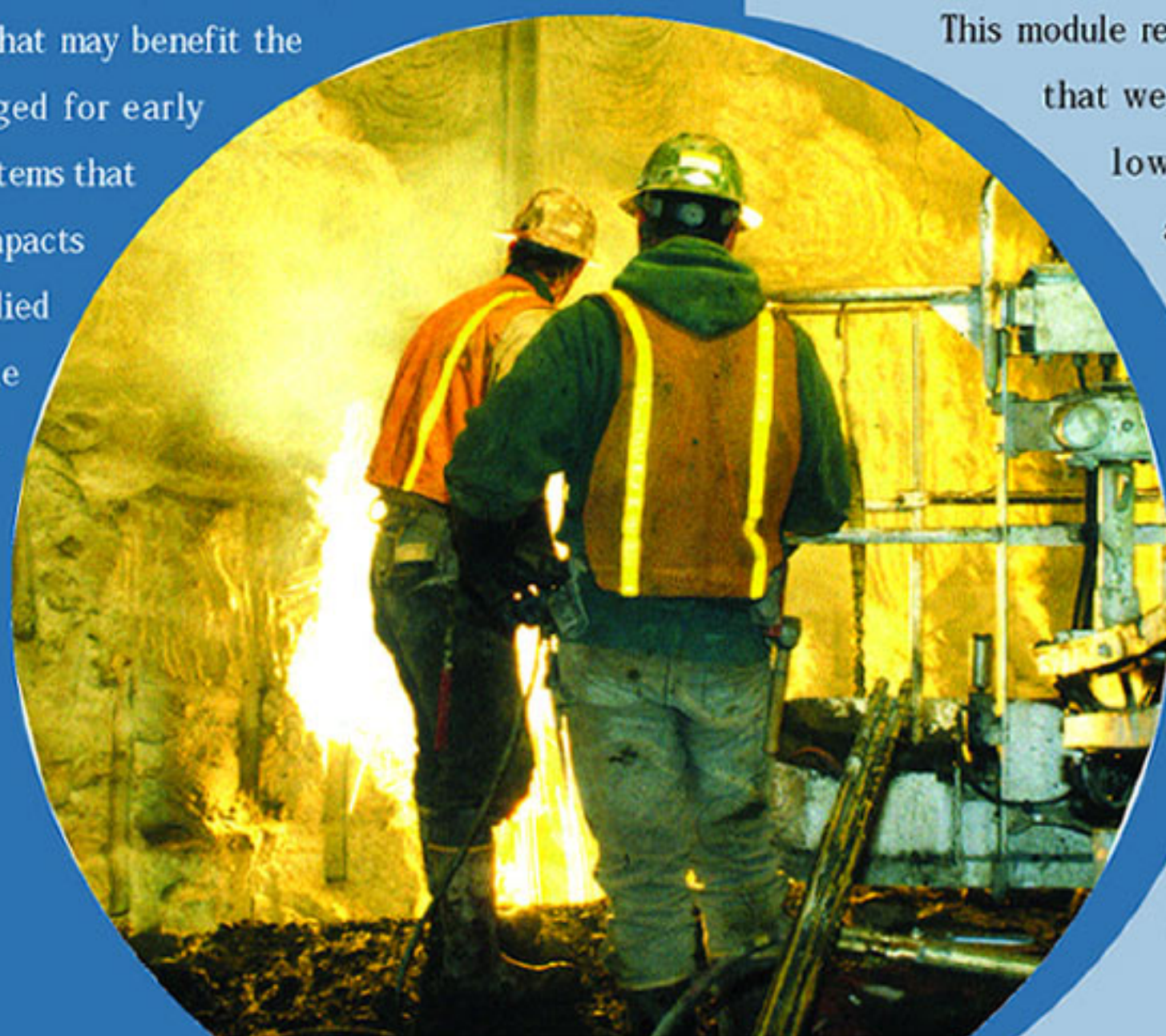
This module provides a broad discussion on the scope and management context of the Central Artery Project. Experiences will be shared by upper management from the Massachusetts Turnpike Authority (MTA) and/or the FHWA, and it will detail recommendations for management systems as well as process development.

### LESSON 2: Financial Planning and Management

Due to its size and duration, the CA/T Project is the first highway project in the Nation to formally utilize a "dynamic finance plan," which studies revenue and cost scenarios. This plan is (at least) updated annually (or more frequently if major changes in costs or revenue projections occur). The plan has proven to be extremely valuable in generating needed dialogue between agencies, the legislature, and/or other affected parties.

### LESSON 3: Cost and Schedule Tracking Systems

The use of comprehensive, monthly cost and schedule tracking systems has proven to be extremely beneficial. As part of these systems, the project has developed an "early indicator" system where items that may benefit the project can be flagged for early implementation, and items that may have negative impacts can be rigorously studied and corrected at the earliest possible time.



### LESSON 4: "Day-to-Day" Management

A "nuts-and-bolts" description of the day-to-day management of design and construction, including the "area team" organization, partnering, interagency coordination, public outreach, use of outside consultants, delegation and single-point accountability, and systems/ process development.



engineering experience on a "mega-project scale," such as the CA/T; however, these cost containment programs can be implemented on projects of all sizes.

### LESSON 8: Environmental and Construction Mitigation Activities

The CA/T Project's commitment to keep the city of Boston open throughout the 14 years of construction, means businesses operating normally, residents experiencing minimal disruption, and traffic moving as well as or better than before construction began. Establishing a suitable mitigation program means weaving these commitments into construction designs from the preliminary stage, monitoring performance against these commitments, and modifying programs and initiatives to suit changing or unanticipated conditions as construction proceeds. The CA/T mitigation program can provide important and beneficial "lessons" for urban infrastructure replacement projects.



## OPERATIONS "LESSONS"

### LESSON 5: "Wrap-up" Insurance

"Wrap-up" Insurance – a.k.a. an Owner-Controlled Insurance Program (OCIP) – replaces the need for project design and construction companies to obtain individual insurance policies. Although used in "building" and other types of public works construction, an OCIP had never been used in highway construction prior to the CA/T Project. This lesson will include details on the "conditions" and implementation of safety programs that lead to substantial cost savings.

### LESSON 6: Innovative Contracting

This module recognizes a number of innovative practices that were implemented, resulting in substantial lower cost-growth through contracting arrangements. Most notably is the "Design To Cost" Program in which project designers contractually commit to a construction cost estimate budget.

### LESSON 7: Cost Containment Programs

The project generated literally dozens of specific (and transferable) cost-containment ideas or strategies that have been implemented. This module will include a discussion of value

mixing and ground freezing techniques. The concentrated, side-by-side use of soil mixing, ground freezing, tunnel jacking, and immersed tube tunnel construction in an isolated area also added several challenges to overcome. The presentation will describe the various soil stabilization techniques and how they were modified to accommodate specific project site conditions.

### LESSON 11: ITS/Traffic Simulation Model

In a complex tunnel and traffic system, a reliable traffic management system is essential.

The CA/T's Integrated Project Control System – developed with the help of the Massachusetts Institute of Technology – will help the completed highway system carry larger volumes of traffic more efficiently, enhance incident response, and inform motorists about highway conditions.



### LESSON 12: Tunnel Fireproofing and Ventilation Systems

This module presents one of the most significant and beneficial successes of the project to date. It will include the background, methodology, and results of the Memorial Tunnel Fire Ventilation Test Program (MTFVTP). The MTFVTP was an industry-first — a full-scale tunnel fire test program that has improved tunnel safety around the world. In addition, it has saved money for other projects by helping designers specify the most cost-effective and safe ventilation systems.



## TECHNOLOGY "LESSONS"

### LESSON 9: Urban Application of Slurry Wall Technology

In confined urban settings, this technique of tunnel wall construction and stabilization will be used much more extensively in the future. It allows work to progress in tight quarters while maintaining continuous traffic movement during excavation. With one of the largest single applications of slurry wall construction in the world, the CA/T is a rich source of information on the design/construction of slurry wall projects.

### LESSON 10: Soil Improvement Techniques

Given the extremely poor soil conditions in key tunneling areas, the project designed innovative and unusually large soil improvement applications that utilized soil